

Remarks

Claims 1-15 are pending in the present application.

Claim 11 is objected to for an informality.

Claims 1-4, 6-9 and 11-14 stand rejected under 35 USC § 102(b) as being anticipated by Schweikard *et al.* (US 6,501,981) (Schweikard).

Claim 5, 10 and 15 stand rejected under 35 USC § 103(a) as being unpatentable over Schweikard in view of Acker *et al.* (US 6,374,132) (Acker).

The Claim Objection

Claim 11 stands objected to because the words “for treating” have been misspelled as “fortreating”. Applicants appreciate this attention to detail and have amended claim 11 to correct this typographical error.

The Present Application

The present application is directed, at least in part, to a target treatment apparatus for treating a target region within a subject. The apparatus includes an MRI apparatus for generating MR images during an MR scan of the subject disposed within an examination region. The apparatus further includes an MRI localizer for receiving the image data from the MRI apparatus wherein the target is localized and a reference marker localizer for non-invasively receiving reference data from a plurality of reference points disposed in proximity to the target wherein the reference points are localized. A tracking processor is also included in the apparatus for receiving localized data from the MRI localizer wherein a relationship between the reference markers and the target region is generated.

By way of one example, as shown in FIG. 1, external reference, or fiducial, markers 210 are placed on the subject such that they are positioned within the imaging region 110 and in a desired proximity to the region of interest 130. The MRI localizer 150 and the reference marker localizer 160 pass data regarding the localization of the tumor 130 and the reference markers 210, respectively, to a tracking processor 300. The tracking processor includes a processor that generates a model relating the position of the tumor with respect to the external markers.

In another embodiment, rather than using external markers as described above, the position of the region of interest 130 can be predicted non-invasively using MR navigators.

As can also be seen in FIG 6 an interventional tool 400' is located within the examination region 110 of the MRI apparatus 100 and in proximity to the target 130. Here, the interventional tool can be a focused ultrasound device situated under the subject 140 and in the subject support 120. More specifically, the ultrasound device can be a phased-array transducer where multiple focal points can be treated simultaneously and/or transducers can be controlled to follow the motion of a target as described herein. Alternately, a focal point of an ultrasound device can be moved to follow a target.

The Schweikard Reference

Schweikard is directed to an apparatus for improving the accuracy and efficacy of surgical treatments and more particularly to locating a target region to be treated and tracking the motion of the target region due to respiratory and other patient motions during the treatment. See, Schweikard, column 1, lines 14-18. More specifically, Schweikard discloses that to track the movement of the target organ 151, the one or more internal markers 152 may be attached to or placed near various locations on or near the target organ 151. Then, as the target organ moves, the internal markers also move as shown by arrows 154. From the placement of the internal markers, it is possible to precisely determine the position of the target organ. In a preferred embodiment, more than one internal marker may be used in order to measure the movement of different areas of the target organ and the internal markers may be made of gold so that, although the internal markers are not visible outside of the body, the internal markers may be viewed using an imaging technique, which may preferably be stereotaxic x-ray imaging, but may also be ultrasound. See, Schweikard, column 5, line 58 – column 6, line 5.

The § 102 Rejections

Claims 1-4, 6-9 and 11-14 stand rejected under 35 USC § 102(b) as being anticipated by Schweikard.

Claim 1 is directed to a target treatment apparatus for treating a target region within a subject, the apparatus comprising: an MRI apparatus for generating MR images during an MR scan of the subject disposed within an examination region; an MRI localizer for receiving the image data from the MRI apparatus wherein the target is localized; a reference marker localizer for non-invasively receiving reference data from a plurality of

reference points disposed in proximity to the target wherein the reference points are localized; and a tracking processor for receiving localized data from the MRI localizer wherein a relationship between the reference markers and the target region is generated.

Applicants respectfully submit that Schweikard does not teach or suggest all of the limitations of claim 1. As noted above, Schweikard discloses the use of internal markers being attached to or placed near various locations on or near the target organ.

Accordingly, Schweikard does not teach or suggest a reference marker localizer for non-invasively receiving reference data from a plurality of reference points disposed in proximity to the target wherein the reference points are localized as set forth in claim 1. Applicants, therefore, respectfully request reconsideration and withdrawal of the rejection of claim 1.

Claims 2-5 ultimately depend from claim 1. For at least the reasons set forth above in connection with the patentability of claim 1, Applicants respectfully submit that claims 2-5 are patentable over the references of record.

Claim 6 is directed to a method of treating a target region within a subject, the method comprising: generating magnetic resonance images of the subject disposed within an examination region; localizing the target region from the MR images; non-invasively localizing a plurality of reference points disposed in proximity to the target; and generating a relationship between the reference markers and the target region.

As noted above in connection with claim 1, Schweikard is directed to the use of internal markers. Accordingly, Schweikard does not teach or suggest non-invasively localizing a plurality of reference points disposed in proximity to the target as set forth in claim 6. Reconsideration and withdrawal of the rejection of claim 6 are respectfully requested.

Claims 7-10 ultimately depend from claim 6. For at least the reasons set forth above in connection with the patentability of claim 6, Applicants respectfully submit that claims 7-10 are patentable over the references of record.

Claim 11 is directed to an apparatus for treating a target region within a subject, the apparatus comprising: means for generating magnetic resonance images of the subject disposed within an examination region; localizing means for localizing the target region from the MR images; reference means for non-invasively localizing a plurality of reference

points disposed in proximity to the target; and modeling means for generating a relationship between the reference markers and the target region.

The foregoing discussion related to claims 1 and 6 can be applied mutatis mutandis to claim 11. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 1.

Claims 12-15 ultimately depend from claim 11. For at least the reasons set forth above in connection with the patentability of claim 11, Applicants respectfully submit that claims 12-15 are patentable over the references of record.

The § 103 Rejections

Claim 5, 10 and 15 stand rejected under 35 USC § 103(a) as being unpatentable over Schweikard in view of Acker.

In light of the patentability of the base claims from which claims 5, 10, and 15 depend, Applicants respectfully submit that the rejections under § 103(a) are rendered moot.

Conclusion

For the reasons set forth above, it is submitted that claims 1-15 distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

If any extensions of time are necessary in connection with this Response A, Applicants hereby petition for such extension. If any fees are due in connection with this Response A, the authorization to charge deposit account 14-1270 for the fees associated therewith is hereby provided.

Respectfully submitted,

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